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# THE USE OF GROUND BLAST FURNACE SLAG , CHROME SLAG AND CORN STEM ASH AS A COATING AGAINST THE CORROSION

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**Abstract**

Metals having chemical and electrochemical reactions with their surroundings can go bad and become unusable. It's called corrosion. Many metals , especially iron , undergo corrosion when exposed to air and water. 1/10 of all metallic materials produced every year becomes unusable and it's not possible to recycle them. Loss caused by corrosion costs billion of dollars every year.

This study presents the results of corrosion resistance of ground blast furnace slag (GBFC) , chrome slag (CS)and corn stem ash. (CSA)

In this study GBFC , CS and CSA , produced as a result of some procedures , are mixed with pitch in different portions. The reason for mixing with pitch is to gain the adherence. Then the iron plates were coated with this mixture. Coated and uncoated plates were undergone corrosion in Na Cl solution (35g/L Na Cl ). Having kept in the solution for one mount , the coated and uncoated plates were taken out and dried. The plates were put into Na Cl solution with the help of electrodes and the potential differences were measured. Our aim to do so was to reduce the potential difference. If the potential difference reduces , the electric currency reduces , so the corrosion is reduced too.

The potential difference of the uncoated iron plates was 0.501 volts. Of coated with pitch 0.301 and mixed up with our experiment materials was 0. So the corrosion was reduced totally.

This means:

Billions of dollars loss is prevented

A profitable use of GBFC , which is environmentally harmful , can be made and the nature can be protected.

An economical use of CS , which is thrown away can be gained

Some profit can be gained from corn stems that are left to be rotten in the fields.

If the substance we've produced is used all the fields that iron is used , such as buildings , ships , water pipes etc , billions of dollars can be saved.

**Keywords:** Furnace slag, chrome slag, corrosion

## Introduction

**Every year billion of dollars are lost due to corrosion.**

## Corrosion

The word 'corrosion' comes from the Latin word 'corrosus' which means 'abrasion' by surroundings. Corrosion is that metals having chemical and electrochemical reactions with their surroundings can go bad and become unusable. Metal are the unabandonable basic elements of industry. Due to improvement in science and technology , corrosion has become an important problem / issue in structures that contain metals. Corrosion is an undesirable event that costs big damage in the economy of many countries.

**The harms of corrosion can be counted as**

Corrosion is the major cause of waste of our metal source . 1/3 of all metals produced becomes unusable at the end of first year.

Along with material loss , we also waste some effort , energy , knowledge and financial sources.

Corrosion pollutes its surroundings and it accelerates metallic corrosion.

Chlorium corrosion that harms human health is a well known fact . Some pieces of planes can be broken due to corrosion and it can lead to some casualties.

Some establishments can become out of service and it leads to lack of efficiency.

**Types of Corrosion**

-Homogenously distributed corrosion
-Pit Corrosion
-Galvanic Corrosion
-Selective Corrosion
-Underground Corrosion
-Corrosion in wet surroundings

**Rust (Corrosion of Iron)**

The most familiar and costly example of corrosion is the formation of rust on iron. Iron and steel structures are highly susceptible to corrosion. The chemistry of corrosion under atmospheric conditions is extremely complex and is catalyzed by $H^+$ aq) explaining why increased acid precipitation causes increased rates of corrosion. Oxygen gas and water must also be present for Iron to rust.

Rusting is a redox reaction , involving the loss and gain of electrons between reactants. An electrochemical cell is created with impurity sites in the iron acting as cathodes for the reduction of $O_2$ :

$$2\ Fe\ (solid) = 2\ Fe^{2+} + 4e^-$$

The electrons given up by the iron reduce atmospheric oxygen to water at the cathode:

$$O_2 + 4H + 4^{e-} = 2H_2O$$

The $Fe^{2+}$ ions formed at the anode are further oxidized by oxygen the overall redox equation:

$$4Fe^{2+} + 3O_2 + 6H_2O = 2Fe_2O_3\ 6H_2O$$

**Hypothesis**

In this study we have searched the use of GBFC thrown away from the steel Factory , the CS thrown away from the chromium factory in our city and corn stems left to be rotten in the fields.These elements are in amorphous structure and due to their chemical qualities they ‘re very resistant to corrosion It’s expected that a protective plate made of above mentioned elements will prevent corrosion to great extents.

20 000 tons of GBFS per year are thrown away , 100 000 tons of CS are thrown too and CSA left to be rotten in the fields. So by these materials we avoid environmental pollution and create the coating.

**The process of experiment**

So in this study , these materials (GBFS , CS and CSA ) we mix with pitch. We put coated and uncoated plates in Na Cl solution. So Na Cl solution with help copper of electrodes for measuring the corrosion in the plates. Our aim was to reduce potential difference. If the potential difference reduces , the electric currency reduces , therefore the corrosion reduces.

The potential difference only with uncoated plates was 0.501 , with pitch 0.301 volts and with our materials was 0.0000000 volts.

**Results**

Billion of dollars are prevented.A profitable use of CS which is thrown away can be gained.A profitable of GBFS, which is environmentally harmful, can be gained.Some profit can be gained from corn stem ash that are left to be rotten in the fields.

**Materials**

**Ground Blast Furnace Slag**

GBFS is the name given to lighter metals collected on surface due to potential difference when impure metals are melted. GBFS is obtained by quenching molten iron slag form blast furnace to produce granular product that then is dried and ground into a fine powder.

**Corn Stem Ash**

Corn stems are the parts up to cm above them have been used for the experiment. The reason to use these parts was that silicon is mostly collected in these parts. Silicon is known as an important element to prevent corrosion.

**Chrome Slag**

When you analyze the chemical composition of chrome slag, you see four dominant elements. These are silicon , magnesium , aluminium and calcium. These elements form 95 % of slag as oxides. There are no organic elements in slag.

**Pitch**

Pitch is a non- christalline viscious material , black or dark brown , which is soluble in carbon disulphide , possessing adhesive and water proofing qualities.

**Methods**

GBFS is 1000 grade Celsius when it comes out of iron factory. At this temperature by pouring cold water it was turned in amorphous state.

The slag made amorphous was dried and sieved in 60 micron sieve.

Having collected from field , corn stems were dried at 250 grade Celsius in a freezing and thawing climate chamber. Then they were burnt is an oven at 500 grade Celsius. In burning the organic materials , the temperature needs to be lower than 700 grade Celsius in order to obtain reactive amorphous silica. Thus , these materials can be burnt with an incinerator or furnace.

Having ash at this temperature , we cold water , was applied to it . That way we had some amorphous corn stem ash. Then we sieved the ash in 60 micron sieve.

When chromium slag out of the factory is located in amorphous state. Chromium slag was divided into small particles by Los Angeles Machine rolls. Chromium slag was divided into small particles and were sieved in 60 micron sieve.

So these materials were mixed with pitch. Coated and uncoated were left in NaCl solution , to be dried later.

And lastly we measured potential difference.

**Discussion and conclusion**

In our research after some experiments , we aimed to find out if the remnants of GBFS CSA and CS could be used against corrosion.

These substances , as in amorphous state , are expected to prevent corrosion. In the market today are materials used against corrosion , but are very expensive. So our project is with 0 cost.

In our research , and experiments we improved a wrapping material that’s made of remnants such as GBFS , CS and CSA , too much produced and with less costs. We avoid environment pollution and make something great for industry.

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